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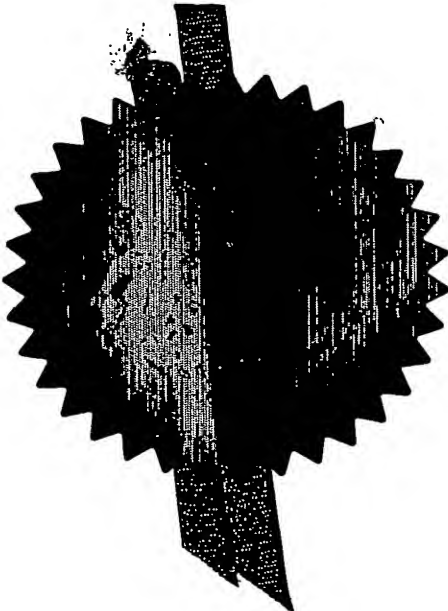
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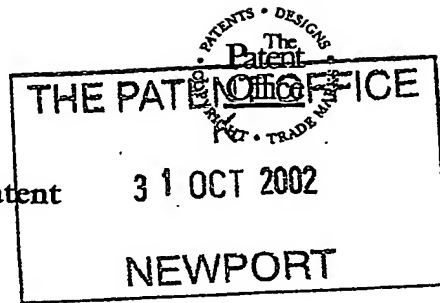
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Request for grant of a patent  
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31 OCT 2002

NEWPORT

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31 OCT 2002

1.	Your reference	2153-P8014-GB		
2.	Patent application number	0225316.9	New	
3.	Full name, address and postcode of the or of each applicant ( <i>underline all surnames</i> )	HM TECHNOLOGY INTERNATIONAL LIMITED Unit 18, Wadsworth Business Centre 21 Wadsworth Road Perivale, Middlesex UB6 7JD United Kingdom		
	Patents ADP number ( <i>if you know it</i> )			
	If the applicant is a corporate body, give the country/state of its incorporation	United Kingdom		
4.	Title of the invention	Document Interpreting Systems		
5.	Name of your agent	ATKINSON BURRINGTON		
	"Address for service" in the United Kingdom to which all correspondence should be sent	25-29 President Buildings President Way Sheffield S4 7UR GB		
	Telephone No:	0114 275 2400		
	Patents ADP number	7807043001		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and ( <i>if you know it</i> ) the or each application number	Country	Priority application number ( <i>if you know it</i> )	Date of filing ( <i>day/month/year</i> )
		N/A	N/A	N/A
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing ( <i>day/month/year</i> )	
		N/A	N/A	
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request?	Yes		

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Continuation sheets of this form

Description

14

Claim(s)

04

Abstract

00

Drawings

04

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Priority documents

N/A

Translations of priority documents

N/A

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

None

Request for preliminary examination and search (*Patents Form 9/77*)

None

Request for substantive examination (*Patents Form 10/77*)

None

Any other documents  
(Please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date Wednesday, 30 October 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Alan G H BURRINGTON CPA  
0114 275 2400

## Document Interpreting Systems

### Background of the Invention

#### 1. Field of the Invention

5 This invention relates to document interpreting systems and is especially applicable to such system for assisting learning of reading or pronunciation or understanding of words, phrases or sentences or interpretation of drawings, pictures, etc. It should be understood that the term "document" covers any printed matter or indeed any written or drawn  
10 matter, and in particular includes books.

#### 2. Description of the Related Art

For effective learning, particularly of language, it is most helpful for a student to have the advantage of considerable attention, if not full time  
15 attention, of a teacher. For example, a young child will often learn to read by looking at a book containing pictures and corresponding words with an adult reading the words as the child follows the words and looks at the associated pictures. Thus the mind of the child is focusing on an image depicting something, is being given the spoken word and is seeing the written word.

20 Furthermore, from the context the child is absorbing the word within the scope of a grammatical structure and is gathering the meaning, either from the pictures if relevant or with the aid of an explanation. At any stage the teacher can discuss with the child any word or its meaning or draw to the child's attention a similar word and provide explanations and definitions of  
25 grammar and meaning, i.e. syntax and semantics.

Similarly, when a child is beginning to read, the adult can monitor the reading and provide immediate feedback on a one-to-one basis to maximise the rate at which the child gains reading skills and remembers vocabulary. The interest and motivation of the child can be maintained at high levels.

5           However, apart from a domestic situation, the cost of such teaching techniques makes them prohibitive, yet there is a very substantial need for such additional support, particularly in the areas of adult illiteracy, foreign language teaching and remedial language teaching.

10           Furthermore, similar needs for feedback and flexible recapitulation of concepts, explanations and facts are needed in many of the areas of education including mathematics and other science subjects. The availability to a student, of a teacher who can be requested to repeat an explanation, elaborate on some point of commentary or deal with any other relevant question is an extremely valuable resource in many situations.

15           It is known to students with e.g tape recordings of an explanation. When such recordings are applied to the process of learning to read, a simple system is one in which a tape recording of a printed work is given to a student and then student has the opportunity of following the words, repeating segments of the tape recording and indeed recording his or her  
20           own attempts at reading the words and comparing with the tape recordings of the tutor. However, such a system is inflexible and hard to operate.

          One published approach to the teaching of language is contained in PCT International Publication No. WO 83/02188 (MERIT BOND LIMITED) wherein printed text is provided with bar codes associated with at least some  
25           of the text, a manually controlled reading device being used to access the bar codes as the user may require, and an electronic processing means used to

cause the apparatus to synthesise voice reproduction corresponding to the text with which the selected bar code is associated. Such a device has limitations in terms of functions fulfilled and in the special preparation required of the printed material, i.e. it can not be used with conventional books.

Another published approach, (PCT WO 87/06752) in the teaching of language is one in which sets of bar codes are arranged on respective lines corresponding to lines of printed text. Each bar code set, when accessed, causing a particular storage location from a message store to be accessed to be reproduced by a speech producer. The limitations of such a system are that a book can not be used in its original format, since bar codes have to be added or overprinted onto the original document at the expense of text. Further, the selection of the bar code set may lead to confusion and small children may have difficulty scanning a bar code.

Yet another published approach (PCT WO 90/15402) relates to a document interpreting system comprising location detecting means on which a plurality of documents to be interpreted may be stacked and for detecting through said documents the location of pointing means directed at an area of the topmost document of said stack, speech storage means for storing speech relating to different areas of said documents and speech reproduction means for reproducing speech stored in said speech storage means corresponding to the area of said topmost document to which said pointing means is directed. In the system disclosed, the pointing means takes the form of a user's finger.

Another published approach (EP 0 572 466) relates to a document interpreting system comprising location detecting means on which a book or

other stack of documents may be placed and electronic pointing means coupled to said location detecting means and adapted in use to be directed at an arbitrary area of the topmost document of the stack of documents, said location detecting means being adapted to detect electronically through said stack the location of said arbitrary area to cause speech stored in a speech storage means associated with said arbitrary area to be reproduced.

A disadvantage with the document interpreting system of EP 0 572 466 is that if the stack of documents, for example the pages of a book, contain documents with metallic embossing or if the humidity of the stack of documents is high then there is considerable distortion in the location detection process leading to a shift in the detected position of the pointing means which can lead to speech associated with an incorrect arbitrary area being reproduced.

The present invention is directed to a document interpretation system which overcomes the above limitations and provides for a practical and useful device which eliminates the need for specially printed codes associated with the words and phrases of the written material and enables a wide variety of normal books to be used including those having metallic embossing or documents having high humidity.

### **Brief summary of the invention**

According to the present invention there is provided a document interpreting system comprising location detection means under which may be placed one or more documents and for detecting the location of pointing means directed at an area of a topmost document of the one or more documents, speech storage means for storing speech relating to different

areas of said one or more documents, and speech reproduction means for reproducing speech stored in said speech storage means corresponding to the area of said topmost document to which said pointing means is directed, wherein said pointing means comprises electronic pointing means coupled to  
5 said document interpreting system and adapted in use to be directed at any arbitrary area of said topmost document, said location detecting means being arranged to detect electronically the location of said arbitrary area for causing speech stored in said speech storage means corresponding to the arbitrary area of said topmost document to which said pointing means is directed to be  
10 reproduced, wherein said location detecting means comprises a transparent or translucent membrane through which the electronic pointing means is directed at the arbitrary area of said topmost document.

Such a system enables, for example, a user to point to any part of a document which is being read and to obtain a spoken version of any text e.g.  
15 words, phrases, sentences, etc in the vicinity of a pointer or a spoken description of any picture in said area. It would also be possible for the spoken version or description to be in a foreign language thereby assisting foreign language learning. It is to be noted that the document being read may be in its original form and does not require any additional matter, e.g. bar  
20 codes for its interpretation.

An exemplary embodiment of the invention will now be described with reference being made to the accompanying drawings.

### **Brief Description of the Several Views of the Drawings**

25 *Figure 1* shows a diagrammatic representation of a document interpretation system in accordance with the present invention;



*Figure 2* depicts in greater detail the appearance of a topmost card shown in *Figure 1* which is useful in explaining the operation of the system of *Figure 1*;

*Figure 3* shows a block schematic diagram of the document interpretation system of *Figure 1*; and

*Figure 4* is a flow diagram relating to the document interpretation system of *Figures 1* and *3*.

### **Written Description of the Best Mode for Carrying Out the Invention**

#### ***Figure 1***

The document interpretation system depicted in *Figure 1* of the drawings comprises a membrane **101** which overlies a cartridge **102** in which are located one or more cards **103** in the form of a stack. The card to be read by the user (not shown) is placed as the topmost card **104** where more than one card is present. The cartridge **102** and membrane **101** are shown as schematically in *Figure 1*. In practise, the membrane **101** may be housed in a frame formed as part of the upper surface of the cartridge **102** of fixedly located on, or hinged to the upper surface of the cartridge **102** by any suitable means. The important aspect is that the membrane **101** is located in use, or may be brought into location for use, such that it overlies the card or cards **103** stored in the cartridge **102**.

The membrane **101** is transparent or at least sufficiently translucent as to allow the user to determine the contents of the topmost card **104** when viewing through the membrane **101**. The membrane **101** comprises a grid **105** formed of conductive stands creating an X-Y pattern dividing the membrane **101** into substantially squared shaped segments.

The membrane 101 is formed from a pair of transparent films, one of which defines a set of parallel conductive strands in a first (X) direction, and the second film defining conductive strands in a second (Y) direction perpendicular to the first direction. The transparent films are Orgacon  
5 Conductive Transparent Films and the conductive strands are defined by screen printing of Strupas ink. The Orgacon films and Strupas ink are supplied by Agfa-Gevaert N.V., of Mortsel, Belgium.

The membrane 101, and specifically the grid 105, is electrically coupled to a printed circuit board (PCB) 109. The PCB 109 has mounted  
10 thereto an Application Specific Integrated Circuit (ASIC) 111. The PCB 109 is further provided with a power source in the form of a battery 110 and a speaker 112. The PCB 109 may be formed as part of the cartridge 102, as part of the frame housing the membrane 101, or as part of a separate unit.

The ASIC 111 is provided with its own power source in the form of a  
15 battery 108. Alternatively, the ASIC 111 may be powered directly from the PCB battery 110.

A pen or pointer 106 is coupled to the PCB 109 by means of a cable  
107. The pointer 106 is adapted to be pointed at an area of the membrane 101 coincident with an arbitrary area of the topmost card 104 viewed through  
20 the membrane 101 so as to enable the co-ordinate location of the arbitrary area to be detected by the membrane 101 and in turn determined by the ASIC 111.

The pointer 106 is, for example, magnetically or capacitively coupled  
25 to the membrane 101 in use. Importantly, since the relative positions of the membrane 101 and the pointer 106 are determined magnetically or capacitively rather than by pressure applied to the membrane 101, the

document interpretation system finds particular application for use with young children who are apt to press randomly and unintentionally on the membrane 101 whilst using the system. With a membrane activated by pressure such contacts would lead to a large number of false readings and hence confusion to the user.

The ASIC 111 contains machine code and/or software programs and solid state circuitry to control operation of the pointer 106, membrane 101 and speaker 112. In addition, the ASIC 111 stores speech associated with areas of the cards 103.

In use, the output from the grid 105 of the membrane 101, consisting of the co-ordinate details of an area of the card 104 to which the pointer 106 is directed, is fed to the ASIC 111 on the PCB 109. The machine code and/or other software encoded in the ASIC 111 resolves the co-ordinate details from the membrane 101 and determines the speech stored in the ASIC 111 which is associated with the area of the topmost card 104 to which the pointer 106 is directed.

It will be appreciated by those skilled in the art that the location of the card 104 or other document to be read, relative to the membrane 101, may be established by, for instance, physical means such as the internal dimensions of the cartridge 102 to ensure the card is placed in a known location relative to the overlying membrane 101. Alternatively, the card 104 or other documents may be placed in the cartridge 102 in any orientation and known features such as corners of the card 104 may be registered by pointing at them through the membrane 101 with the pointer 106 in an initialising registration procedure. By this method the location of the words and pictures, etc. may be calculated by such known means as simple co-

ordinate geometry routines.

In addition, it will be appreciated that the ASIC 111 will need to determine which of the cards 103 is the topmost card 104. This may be done, for example, by providing a unique identifier area on each card 103 to which the pointer 106 is first directed. By arranging for each card 103 in the stack to have its identifier area in a different position, the ASIC 111 is able to determine the identity of the topmost card 104. Alternatively, a manual mechanism may be provided wherein the PCB 109 is provided with an input terminal by which the user may enter an identifier, e.g. an alpha-numeric character or characters, to identify the topmost card 104.

In use of the system thus far described, a user points the pointer 106 at an area at the topmost card of the stack of cards 103, e.g. some printed text or a picture. The grid 105 of the membrane 101 detects the presence of the pointer 106 by means of the magnetic or capacitive changes in the grid 105 of the membrane 101 caused by the proximity of the pointer 106. The membrane 101 outputs signals representing the co-ordinates of the designated area to the ASIC 111. The machine code or software program embedded in the ASIC 111 processes the signals and resolves the corresponding co-ordinates and generates a signal instructing the speaker 112 to output an audio signal corresponding to speech corresponding to the printed text pointed to on the card 104 or alternatively corresponding to the picture pointed to on the card 104.

Optionally, the user of the system can access a button or switch either on, for example the stylus to give a real voice reply of individual words when touched by the pointer 106. Alternatively, another button may be provided which when accessed causes reproduction of the whole sentence when the

first or any word in that sentence is touched by the pointer **106**. Another button may be provided which when accessed allows the user to receive prompts, such as a suggestion to look the syllables within the word selected or the system can be set up to sound out the word phoneme by phoneme. A further button may be provided which, when accessed by the user, will give an explanation of the word or picture which may be in terms of its definition, mode of usage or other commentary.

The system may also be used for teaching a second language, in which case, for example, a sentence can be reproduced in both languages in the correct idiom for each language using two different buttons, e.g on the cartridge **102**. Each word can also be represented in each language, word for word, by the selection an appropriate button. Where complex multi-syllable foreign words are being taught, the word may be represented both in its normal presentation at normal dictation speed and also by a further selection at a slowed down speed enabling the student to dissect the pronunciation of the word, syllable by syllable.

Some examples of the use of the system described with reference to *Figure 1* will now be described with reference to *Figure 2* which depicts the topmost card **104** of *Figure 1* in greater detail.

Referring to *Figure 2*, a rectangular area **201** is reserved on cards **103** for displaying a unique identifier. Thus card **104** has a unique identifier **202** within the area **201**. Consequently, using pointer **106** of *Figure 1* to point to rectangular area **202** identifies card **104** to the document interpretation system of *Figure 1*.

Using pointer **106** to point to area **203** would cause the sentence "K is for Katie kangaroo" to be reproduced. Pointing to area **204** may cause the

phrase "hello I am Katie kangaroo" to be reproduced.

Pointing in each of the areas **205** to **213** inclusive would cause the individual words "kangaroo", "kitten", "Kite", "Orange", "K", "is", "for", "Katie" and "Kangaroo", respectively, to be reproduced.

5 It should be appreciated that the rectangular areas referred to in *Figure 2* are used by way of example only and other shaped areas, such as a circular shaped areas may be used.

In *Figure 3* of the drawings, there is shown a block schematic diagram relating to the document interpretation system of *Figure 1*. This comprises the membrane **101** which affords an output **308** to the PCB **109**, which is itself  
10 connected to the pointer **106** via the cable **107** and to the speaker **112**:

The PCB **109** has mounted thereon the ASIC **111** which typically comprises a microprocessor **330** which operates under the control of a program stored in read only memory "ROM" **331** and receives the signals representing the co-ordinate details via output **308** from the membrane **101**.  
15 A random access memory (RAM) **332** is provided in which is stored the speech signals corresponding to the various areas of the documents being read, e.g. the cards **103**. The micro processor **330** outputs the speech signals to the speaker **112**, via an input/output (I/O) interface **333** which causes the  
20 speech signals to be reproduced by the speaker **112**.

It is envisaged that that random access memory **332** may take the form of a removable RAM-card in which the various speech signals are stored corresponding to the different areas of the cards **103**, thereby enabling a set of cards **103** and associated RAM-card to be sold as a package.

25 In *Figure 4* of the drawings there is shown a flow diagram of a typical operating system of the arrangement depicted in *Figure 3*. At step **401**, the

micro-processor 330 monitors the membrane 101 for new data. The new data is decoded at step 402 to obtain the corresponding speech signal stored in the RAM 332. At step 403, the speech signal is output to the speaker 112, the output of which is monitored by the micro-processor 330 via the I/O interface 333, at step 404, to determine the conclusion of the speech signals  
5 corresponding to the selected area. The system is then ready for re use.

It will be appreciated that new cards, or locally generated documents, e.g. flash cards and picture stories, may have their textual and pictorial co-ordinates recorded by means similar to that of *Figure 1* with the system  
10 operating in a "writing" mode. In this mode the co-ordinates of individual words, pictures, phrases, etc. are read, via the pointer 106, from cards placed in the cartridge 102 under the membrane 101 by the program in the read only memory 331 (*Figure 3*). These co-ordinates are then converted into the corresponding speech signals stored in the random access memory 332 for  
15 subsequent use in the "reading" mode described above.

The document interpreting system which has been described is advantageous in that it enables normal printed or written documents to be "read" without special overprinting of bar codes, magnetic codes, etc. The system can also operate with documents containing metallic embossing or  
20 having pages with high humidity content. RAM-cards and sets of cards 103 may also be sold as a package in respect to particular items for use by teachers, pupils, etc. on equipment in many different locations.

It should be appreciated that the document interpreting system which has been described has been given by a way of example only and various  
25 modifications may be made dependent upon any particular application. Although the pointer 106 has been shown as connected to the PCB 109 by

means of a cable 107, it may be remotely connected to it using, for example, an infrared, radio or other link. Also, although the use of an ASIC 111 in conjunction with a speaker has been described, other speech storage systems may be used, such as using tape or compact disk and associated player. Other output devices may also be used such as headphones.

Further, whilst the set of cards 103 has been described as being stored in a cartridge 102, other means of locating the cards 103 relative to the membrane 101 may be utilised, for example, by clipping or otherwise temporarily fixing the card 104 or cards 103 to the underside of the membrane 101.

Further, a mechanism may be provided to enable the cards 103 in the cartridge 104 to be shuffled so as to change the identity of the topmost card 104. For example, an aperture may be provided in the cartridge 102 to allow the stack of cards 103 to be removed, manually shuffled and reinserted into the cartridge 102.

The system may also be used with documents other than individual cards 103. For example, the system may be used with complete books wherein the membrane 101 is placed over each page of the book in turn. Advantageously, means may be provided, such as a book stand, for holding the book at rest with the membrane 101 hinged thereto such that the membrane 101 may be hinged upwards away from contact with the page of the book to allow for the pages to be turned. The membrane 101 may then be hinged back down into contact with the subsequent page of the book.

Another form of document that may be used with the system is a scroll comprising an elongate document wound onto one or a pair of rollers. In use, the roller or rollers can be rotated so as to bring the required portion of the



document into line with the membrane 101.

Further, while it is important that the membrane 101 is transparent or at least translucent, the membrane 101 may be manufactured to be flexible or inflexible. In particular, where the membrane 101 is flexible, a separate strengthening member may be provided, for example, a frame to stiffen the membrane 101.

**Claims**

1. A document interpreting system comprising location detecting means under which may be placed one or more documents and for  
5 detecting the location of pointing means directed at an area of a topmost document of the one or more documents, speech storage means for storing speech relating to different areas of said one or more documents, and speech reproduction means for reproducing speech stored in said speech storage means corresponding to the area of said topmost document to  
10 which said pointing means is directed, wherein said pointing means comprises electronic pointing means coupled to said document interpreting system and adapted in use to be directed at an arbitrary area of said topmost document, said location detecting means being arranged to detect electronically the location of said arbitrary area for causing speech stored in  
15 said speech storage means corresponding to the arbitrary area of said topmost document to which said pointing means is directed to be reproduced, wherein said location detecting means comprises a transparent or translucent membrane through which the electronic pointing means is directed at the arbitrary area of said topmost document.

20

2. A document interpreting system as claimed in claim 1, wherein the membrane comprises co-ordinate detecting means for affording an output corresponding to the co-ordinate location of said electronic pointing means on said topmost document.

25

3. A document interpreting system as claimed in claim 2, wherein said co-ordinate detecting means comprises a network of conductive strands embedded in or in contact with said membrane.

5 4. A document interpreting system as claimed in claim 3, wherein said conductive strands comprise of a conductive coating on said membrane.

10 5. A document interpreting system as claimed in any preceding claim wherein said electronic pointing means is coupled magnetically to said membrane.

15 6. A document interpreting system as claimed in any of claims 1 to 4, wherein said electronic pointing means is coupled capacitively to said membrane.

7. A document interpreting system as claimed in any preceding claim, wherein said membrane is flexible.

20 8. A document interpreting system as claimed in any of claims 1 to 7, wherein said membrane is substantially rigid.

9. A document interpreting system as claimed in any preceding claim, wherein said membrane is held in a frame.

10. A document interpreting system as claimed in any preceding claim, wherein said speech storage means comprises an abdication specific integrated circuit (ASIC) and said speech reproduction means comprises a speaker.

5

11. A document interpreting system as claimed in claim 10, wherein said ASIC comprises a random access memory (RAM) for storing speech signals corresponding to areas of said one or more documents, a micro-processor which operates under the control of a program stored in a read only memory (ROM) to decode signals received from the membrane indicative of the location of said arbitrary area and to instruct said random access memory to output one or more of said speech signals corresponding to said arbitrary area to said speaker, via an input/output interface to cause said one or more speech signals to be reproduced by the speaker.

15

12. A document interpreting system as claim in any preceding claim, wherein said one ore more documents are received in use in a housing for maintaining said documents in a stack with one of said documents topmost so as to be visible through said membrane.

20

13. A document interpreting system as claimed in claim 12, wherein said housing comprises means for shuffling said one or more documents so as to change the identity of said topmost document.

25

14. A document interpreting system as claimed in any preceding claim, wherein said documents are individual cards.

15. A document interpreting system as claimed in any preceding claim, wherein said one or more documents comprise an elongate sheet wound onto one or more rollers.

5

16. A document interpreting system substantially as herein before described with reference to or as shown in the accompanying drawings.

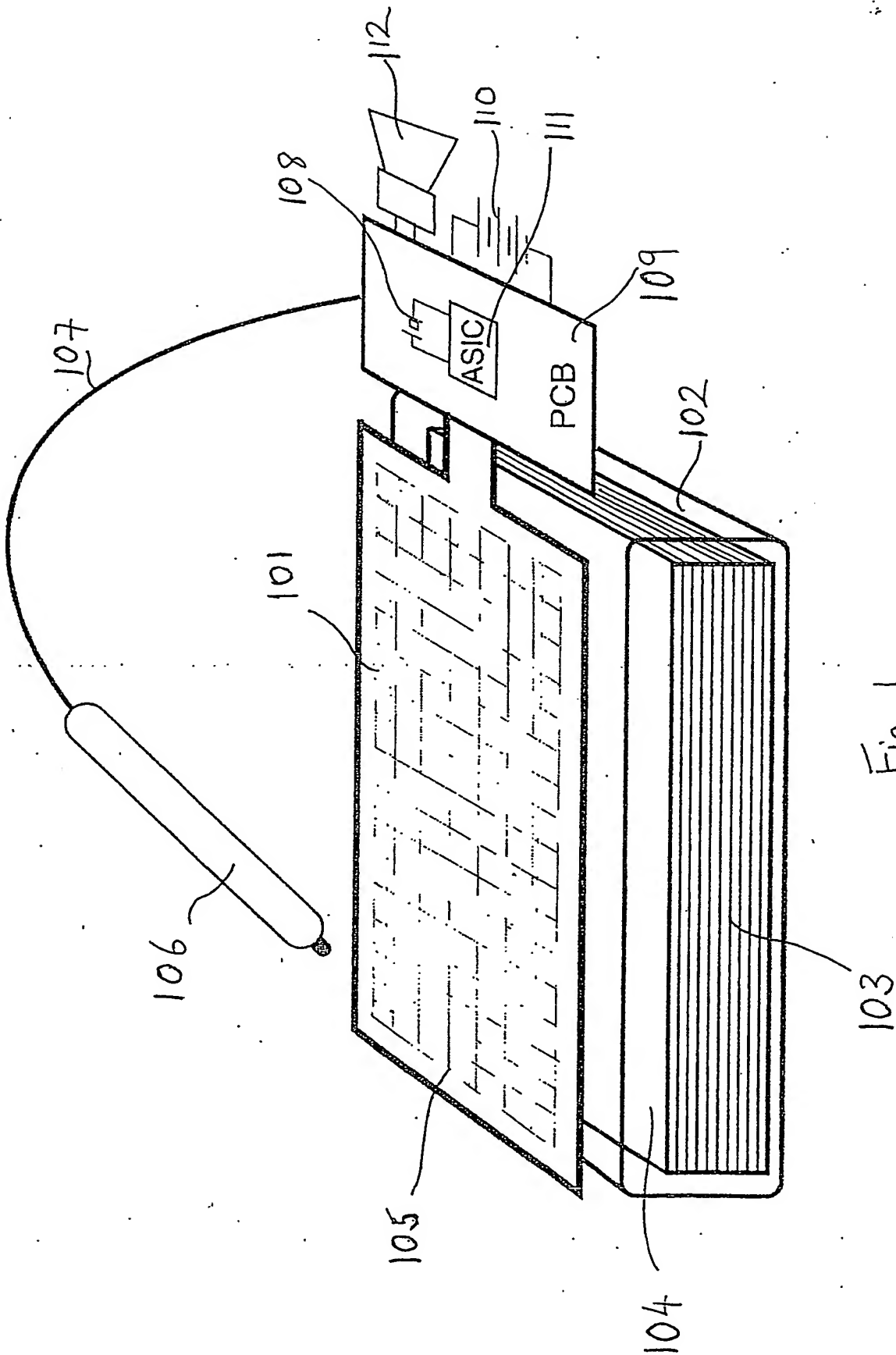


Fig. 1

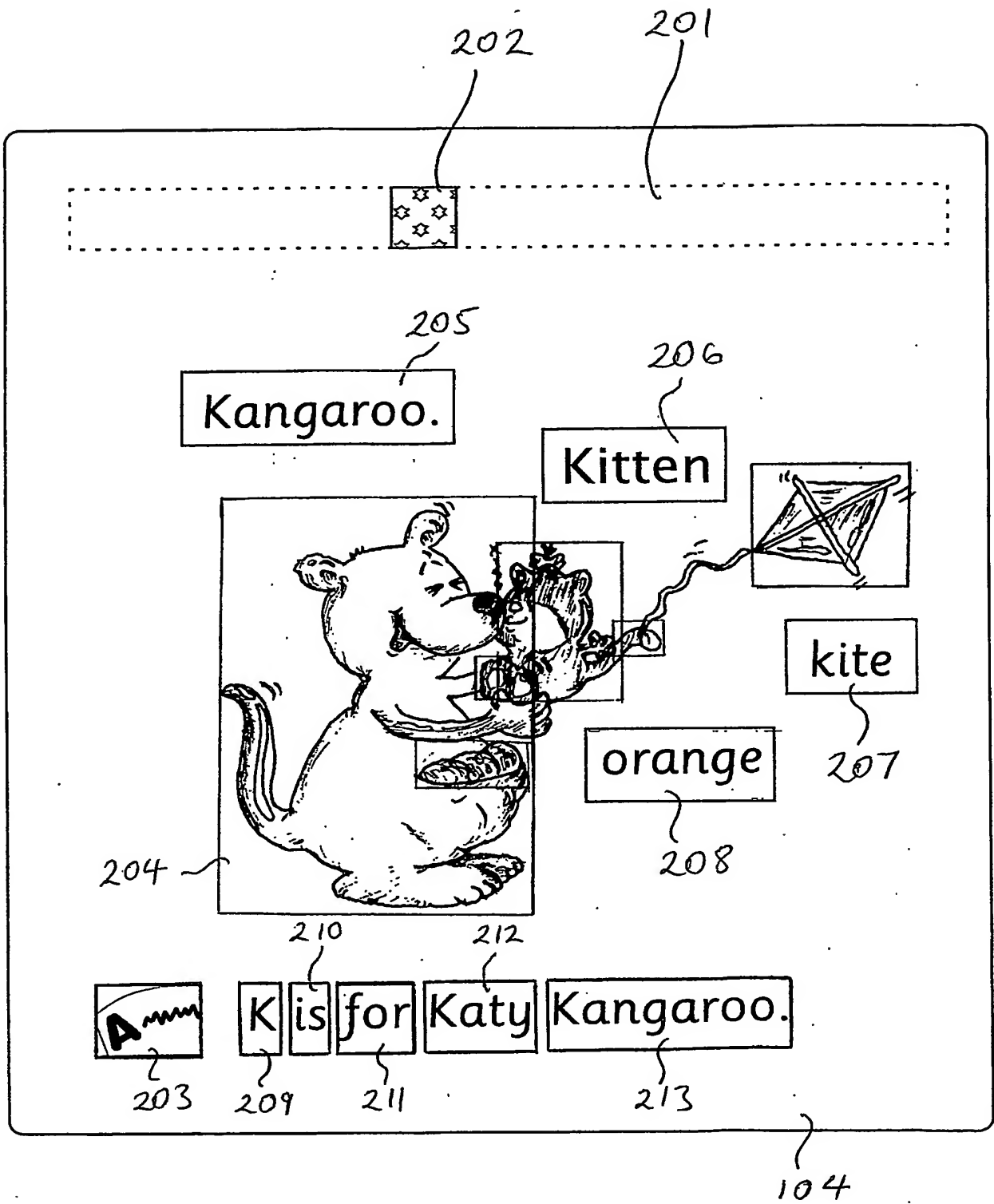


FIG. 2

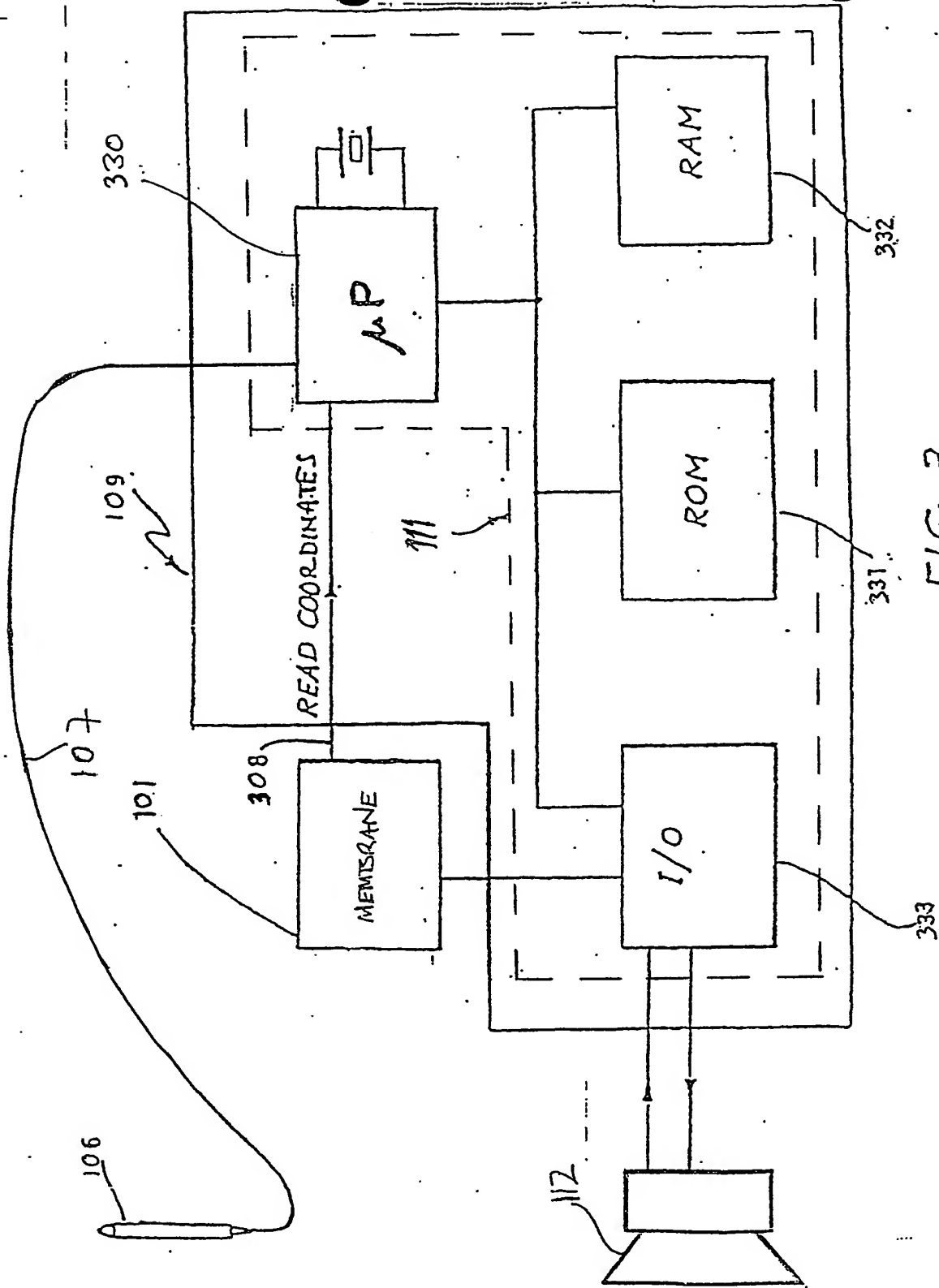


FIG. 3



4/4

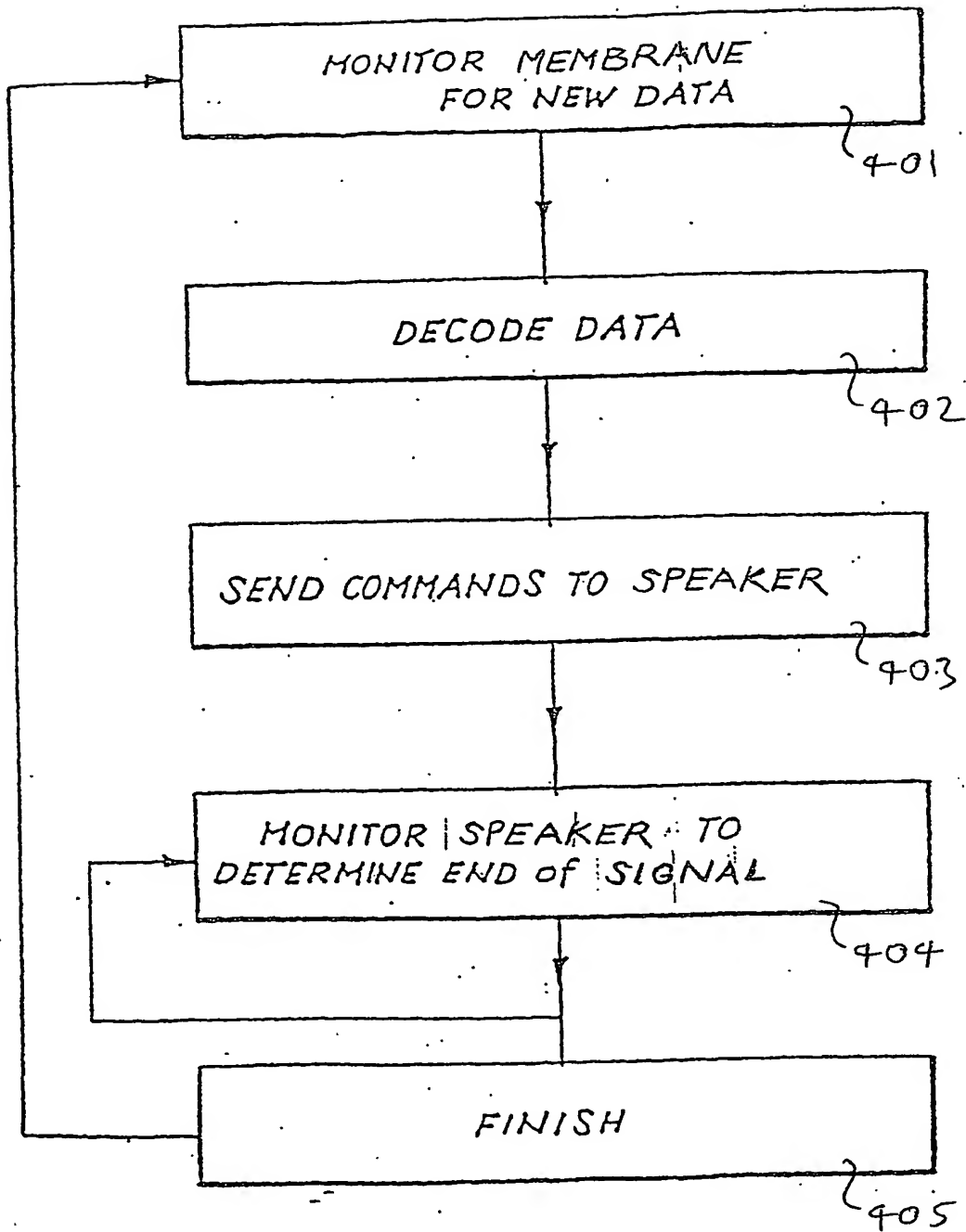
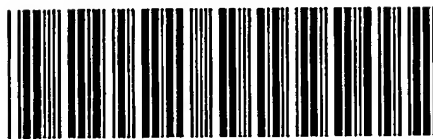


FIG. 4

PCT Application

**GB0304709**



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